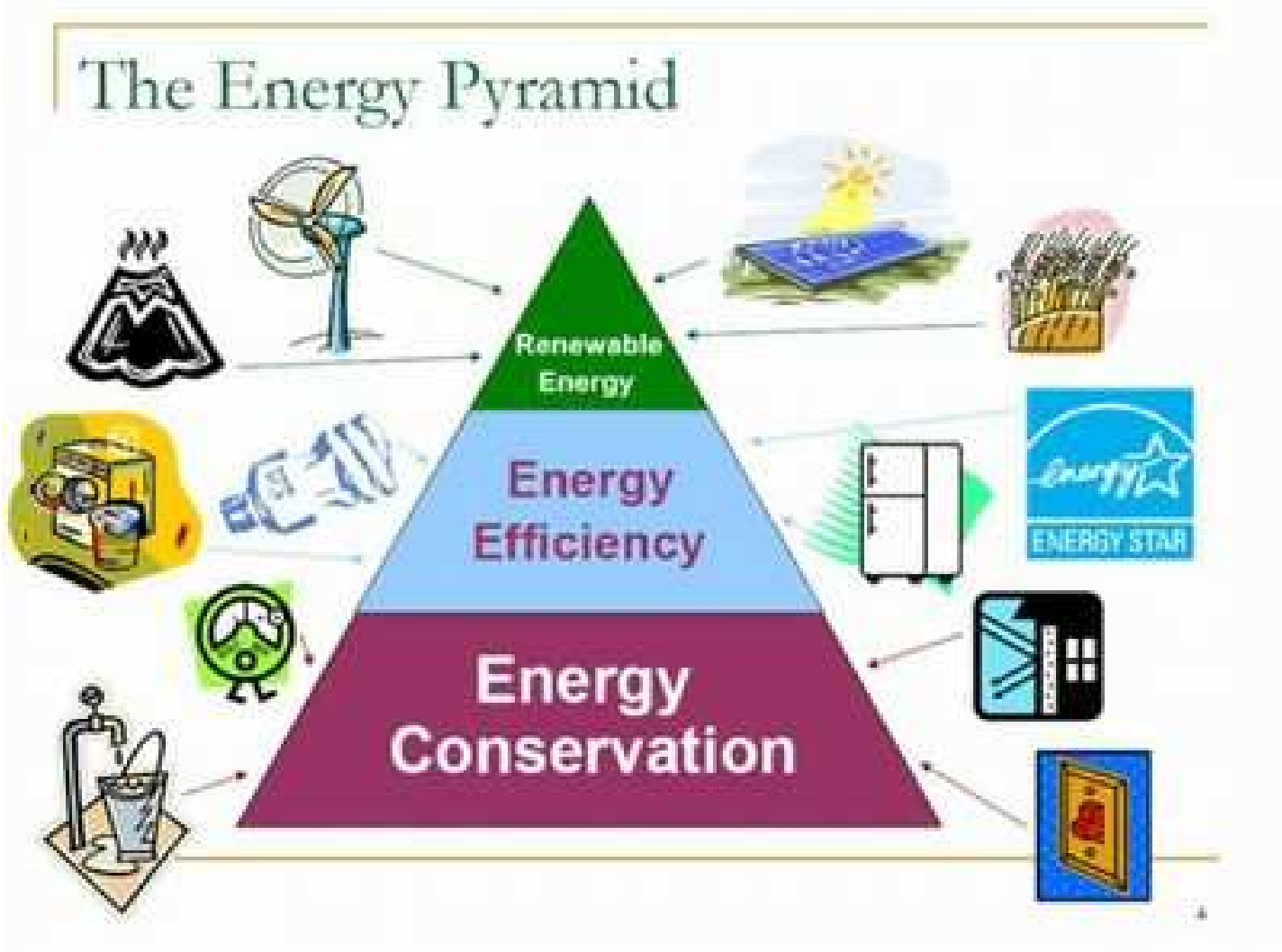
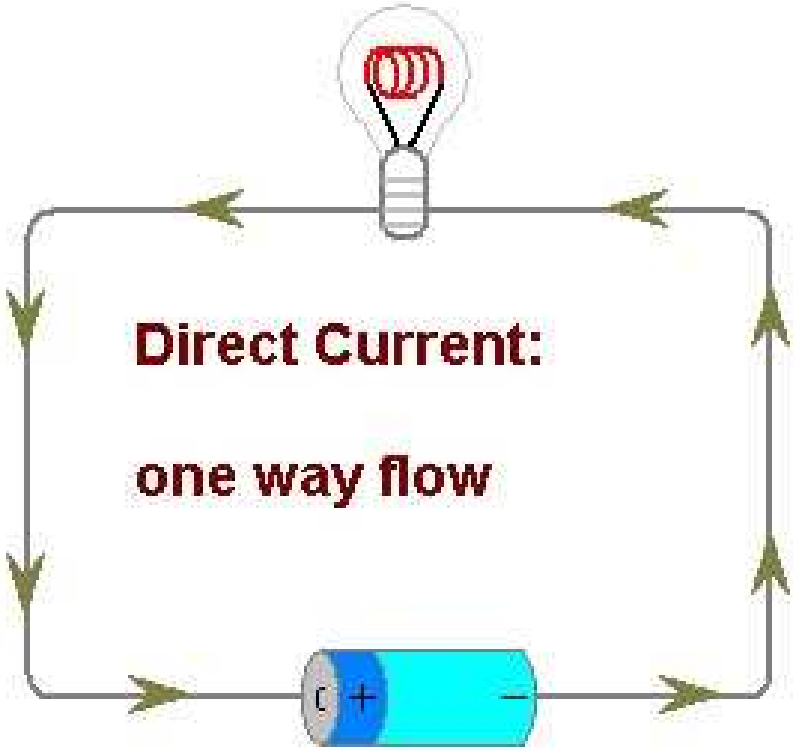
12.1 Electricity at Home



Direct Current

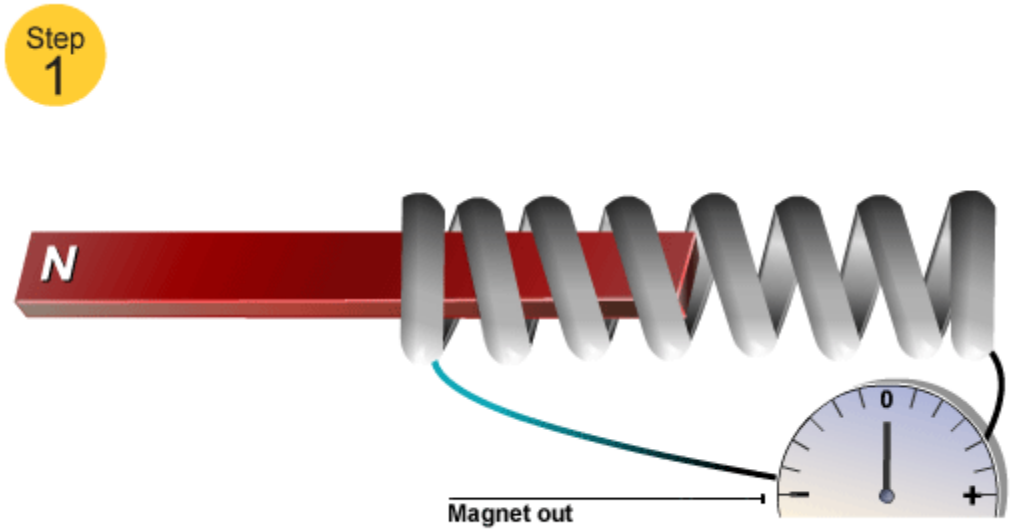
- Current in which charged particles travel through a circuit in only one direction



Alternating Current

- Current in which the direction of the current reverses, or alternates. (animation)

- Generated when a magnet and a coil of wire are moved relative to each other.

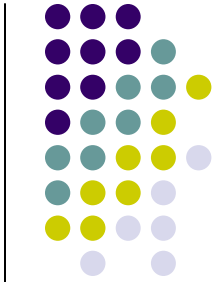


The Advantages of Alternating Current

- Large electrical generators happen to generate AC naturally, so conversion to DC would involve an extra step.

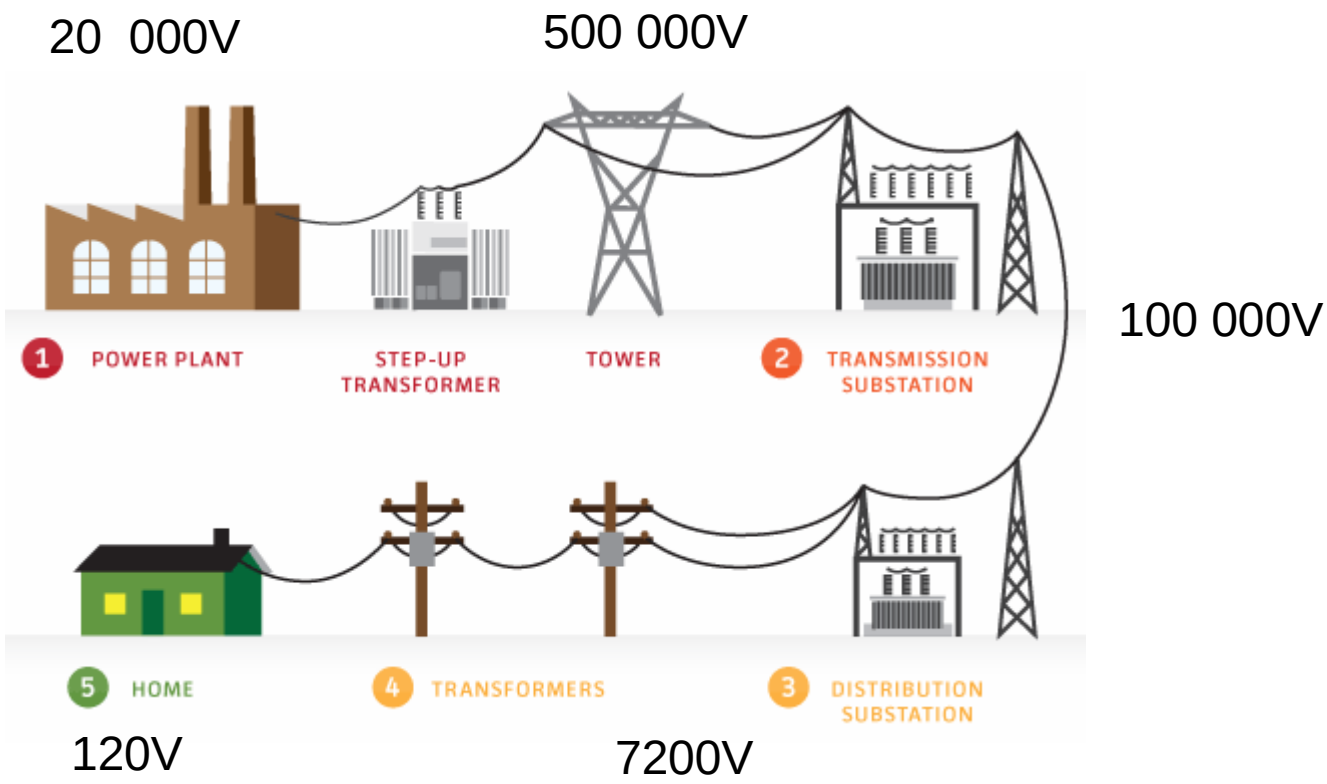
- It is easy to convert AC to DC but expensive to convert DC to AC, so if you were going to pick one or the other AC would be the better choice.

Generating and Distributing Energy



- Generating plant uses moving water, wind or heat from burning fossil fuels or through nuclear reactions to produce energy (AC)
- A **transformer** reduces or increases voltage.
- Since only <20 000V produced, a **step-up** transformer must increase it (up to 500 000V)

- Near your home, transformers decrease the voltage for use with low-voltage equipment in your homes (use 120V to 240V).



- Electricity is distributed in your home through the **distribution panel** which consists of **circuit breakers**
- Circuit breakers lead to a number of loads, if the current becomes too great, the circuit breaker will shutdown, opening the circuit and stopping current flow.

Other safety devices in your home

- define on your own: ground fault circuit interrupter, wall outlet, surge protector, power bar.

12.2 Using Electrical Energy Wisely

- **Electrical power** is the rate at which an appliance uses energy.
- Power (V x I) is measured in **watts** (W), however this is a relatively small unit of measure. When measuring power consumption in our homes we use **kilowatt•hours** (kW•h)
- 1 kW = 1000 W
- See p. 554 for metric conversions

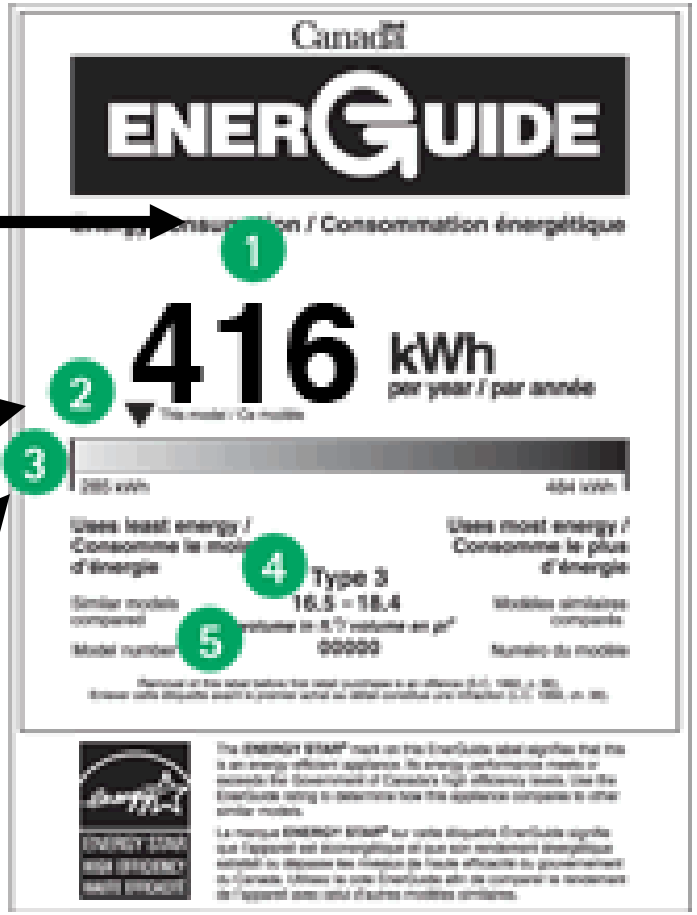
3 Factors that affect the amount of energy used:

- Power rating (in kW), listed on the appliance
- Appliance setting (do you use the heavy wash setting on a dishwasher)
- Length of time used

EnerGuide Labels

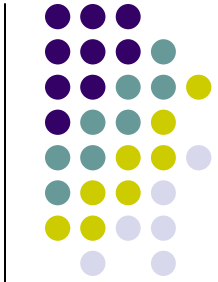
New appliances show the amount of energy they use in one year:

- 1. Average annual energy consumption of the appliance in kilowatt hours (kWh)
- 2. Energy efficiency of the appliance relative to similar models
- 3. Annual energy consumption range for models of this type and size



- Products earn an Energy Star rating when they use 10-50% less energy/water compared with a standard product in the same category.

Cost of Electrical Energy



- The cost of electrical energy depends on the amount of energy that is used and the price that is charged for it.

- The cost is calculated by multiplying the amount of energy used (kW•h) by the price (¢/kW•h).
- Sample problems p. 495, Practice Problems

Efficiency

- Large portions of energy are lost when we transfer the electrical energy back into thermal, sound, or chemical energy to make our lights and appliances function.

- The appliances use only a portion of the energy. Some appliances are better at using more of the electrical energy that it receives. They are said to be more efficient.

- We can calculate the efficiency of an appliance or power plant by comparing the energy output that is useful with the total energy input.

$$\% \text{ Efficiency} = \frac{\text{useful energy output}}{\text{total energy input}} \times 100$$

- The energy input to an electrical device is usually stated as power (in kW) multiplied by the time (in seconds) that it operates.

- 1 kJ = 1 kW•s
- Sample Problem, p. 498; Practice Problems

Homework

- P. 485 – 500
- P. 491 #6, 8
- P. 500 #1 - 6, 8